Final – Revision 1
Sampling and Analysis Plan for Outdoor Ambient Air Monitoring at the Libby Asbestos Site, Operable Unit 4 Libby, Montana

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November 30, 2006

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Contract No. DTRT57-05-D-30109

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Task Order No. 00006

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Acronyms

BNSF	Burlington Northern Santa Fe
CAR	Corrective Action Request
CDM	CDM Federal Programs Corporation
COC	chain-of-custody
DOI	Daily Observation/Impact
DQOs	data quality objectives
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
FSDS	field sample data sheet
FSP	field sampling plan
GPS	global positioning system
GSD	geometric standard deviation
HASP	health and safety plan
HQ	hazard quotient
ISO	International Organization for Standardization
KDC	Kootenai Development Corporation
LA	Libby amphibole
MCE	mixed cellulose ester
MET	meteorological
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
OU	operable unit
PLN	Poisson lognormal
PM	project manager
PPE	personal protective equipment
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RfC	cumulative reference concentration
RPM	remedial project manager
SAP	sampling and analysis plan
s/cc	structures per cubic centimeter
SOP	standard operating procedure
TEM	transmission electron microscopy
TWF	time weighted fraction
UCL	upper confidence limit
µm	micrometer
Volpe Center	John A. Volpe National Transportation Systems Center
%	percent

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Section 1
Introduction

This document serves as the sampling and analysis plan (SAP) for an outdoor ambient air monitoring program to be initiated in October 2006 as part of the ongoing remedial investigation for the Libby Asbestos Site Operable Unit (OU) 4. This SAP outlines the sampling and analysis to be conducted by CDM Federal Programs Corporation (CDM) personnel during the collection of outdoor ambient air samples within the Libby Valley.

This SAP contains the elements required for both a field sampling plan (FSP) and quality assurance project plan (QAPP). This SAP was developed in accordance with the *Environmental Protection Agency* (EPA) *Requirements for Quality Assurance Project Plans, EPA QA/R-5* (EPA 2001) and the *Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G4* (EPA 2006a).

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The purpose of this SAP is to describe the sampling objectives, locations, measurement methods, and data quality objectives (DQOs) for the outdoor ambient air sampling program. The SAP is organized as follows:

Section 1 - Introduction
Section 2 – Site Background
Section 3 – Data Quality Objectives
Section 4 – Sampling Program
Section 5 – Laboratory Analysis and Requirements
Section 6 – Assessment and Oversight
Section 7 – Data Validation and Usability
Section 8 - References

Appendices

Appendix A	Standard Operating Procedures (SOPs)
Appendix B	Libby Asbestos Project Record of Deviation Form
Appendix C	Example of Equipment Shelter
Appendix D	Documentation of Pilot Study

1.1 Objectives

This section defines objectives of the ambient air monitoring program and the intended use of the data.

As determined by previous investigations conducted at the Site, Libby amphibole (LA) is present in multiple environmental media in Libby including: indoor air, outdoor ambient air, indoor dust, vermiculite insulation, and soils. As a result, residents of Libby may be exposed to LA, and these exposures may pose a risk of

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cancer and/or non-cancer effects. One pathway that is of potential concern to EPA is inhalation of LA in outdoor ambient air.

There are two objectives of the program. The first objective is to collect data of sufficient representativeness and quality to estimate human health risks associated with inhalation of LA in outdoor ambient air in and around the city of Libby. Estimates of human health risks require the characterization of the long-term average concentrations of LA. The second objective is to collect data to characterize the spatial patterns and temporal trends of LA occurrence in outdoor ambient air within the study area at the Libby Superfund Site.

The specific activities detailed in this SAP will be used to implement and conduct a monitoring program for outdoor ambient air in the Libby Valley. Sampling will be conducted at a specified frequency from multiple locations chosen to provide spatial coverage of the study area.

1.2 Project Schedule and Deliverables

Sampling is expected to begin October 2006 and will continue on a regular schedule for at least one year until the EPA risk assessment and management teams determine that the amount of data collected is sufficient to support final decision-making for this exposure pathway. Interim data reports summarizing outdoor ambient air data collected to date will be generated no less than once every two months in order to keep project managers informed as to the data and findings. Interim data reports will be shared with the public through EPA when sufficient data have been collected to provide a meaningful basis for data interpretation.

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Section 2
Site Background

This section describes the site location, history, and information regarding previous outdoor ambient air data.

2.1 Site Location

The Libby Asbestos Site is centered within the community of Libby, Montana, located within Sections 3 and 10, Township 30 North (T30N), Range 31 West (R31W) of the Libby Quadrangle in Lincoln County, Montana (Figure 2-1). The Site includes current homes and other businesses, which may have become contaminated with asbestos fibers as a result of the vermiculite mining and processing conducted in and around the City of Libby, as well as other areas in the vicinity that may have been impacted by mining-related releases of asbestos.

2.2 Site History

Since 1999, EPA has conducted sampling and cleanup activities to address highly contaminated areas in the Libby Valley. The EPA investigation was initiated in response to published media articles, that detailed extensive asbestos-related health problems in the Libby population. While at first the situation was thought to be limited to those with direct or indirect occupational exposures, it soon became clear that there were multiple exposure pathways and many persons with no link to mining-related activities were affected.

The site was listed on the Superfund National Priorities List (NPL) in February 2002.

For long-term management purposes, the Libby Asbestos Site has been divided into seven OUs:

- OU1. The former Export Plant is defined geographically by the property boundary of the parcel of land that included the former Export Plant.
- OU2. The exact geographic area of OU2 has not yet been defined, but includes areas impacted by contamination released from the former Screening Plant. These areas include the former Screening Plant, the Flyway property, the Highway 37 Right-of-Way adjacent to the former Screening Plant and/or Rainy Creek Road, the Wise property, and the Kootenai Development Corporation (KDC) Bluffs. The KDC Bluffs area is located directly across the Kootenai River from the former Screening Plant.
- OU3. The mine OU includes the former vermiculite mine and the geographic area (including ponds) surrounding the former vermiculite mine that has been impacted by releases from the mine, including Rainy Creek and the Kootenai

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River. Rainy Creek Road is also included in OU3. The exact geographic area of OU3 has not yet been defined but will be based primarily upon the extent of contamination associated with releases from the former vermiculite mine.

- OU4. OU4 is defined as residential, commercial, industrial (not associated with former W.R. Grace operations), and public properties, including schools and parks in and around the City of Libby, or thoses which have received material from the mine not associated with W.R. Grace operations. Highway transportation corridors such as Highway 37 (including the five miles of Highway 37 beginning at the intersection of Rainy Creek Road and extending into the town of Libby) are also included in OU4. Portions of Highway 37 associated with the Screening Plant are addressed in OU2 and are therefore excluded from OU4.

- OU5. The former Stimson Lumber Mill is defined geographically by the parcel of land that included the former Stimson Mill.

- OU6. The rail yard owned and operated by the Burlington Northern and Santa Fe Railroad (BNSF) is defined geographically by the BNSF property boundaries and extent of contamination associated with the rail yard. Railroad transportation corridors are also included in this OU.

- OU7. The Troy OU includes all residential, commercial, and public properties within the town of Troy.

EPA is preparing to conduct a baseline human health risk assessment for OU4. The results of the baseline human health risk assessment will be incorporated into the remedial investigation and feasibility study for OU4. As discussed in the Conceptual Site Model (EPA 2006c), one exposure pathway that is of potential concern to EPA and which will be evaluated quantitatively in the OU4 risk assessment is inhalation of outdoor ambient air by area residents and workers. This outdoor ambient air monitoring plan is focused on collecting data to support the evaluation human exposure and risk from LA in outdoor ambient air in OU4. Although outdoor ambient air in OU4 may be impacted by any activity that causes LA to be released from a source, it is currently believed that the main source of LA in outdoor ambient air in the vicinity of Libby is release from contaminated soil in and around the community. This is because contaminated soils occur in multiple locations in and around Libby, and because major waste piles and other obvious sources of LA are believed to have been removed from Libby. The remaining contaminated soils can serve as a continuous source of LA release into the air. Releases of LA from soil into outdoor ambient air may be due either to wind blowing over the soil, or from a variety of disturbances of the soil by human activities which occur randomly.

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2.3 Summary of Outdoor Ambient Air Monitoring in Libby

Beginning around 2000 and continuing through 2002, EPA collected outdoor ambient air samples at a number of locations around Libby to gain an initial understanding of LA concentration typically observed in outdoor air. Locations where samples were collected included:

- Fitness Center at the City Hall Building (952 East Spruce Street)
- McGrade Elementary School (899 Farm to Market Road)
- Plummer Elementary School (247 Indian Head Road)
- Rainy Creek Road (various locations from intersection with Highway 37 to turnouts along the road to the mine summit)
- Lincoln County Courthouse Annex (418 Mineral Avenue)
- Lincoln County Landfill
- Station FA-1 (on the northwestern boundary of the River Runs Through It subdivision)
- Stimson Lumber Property

These samples were collected to support removal and sampling programs in the area. Details regarding sample collection procedures and analytical methods are described in the Summary of Asbestos Levels in Ambient Air in Libby, Montana report prepared by EPA (EPA 2006b). At some locations, air samples were collected over the entire three-year period. At other locations, air samples were collected for less than three years.

In addition, samples of outdoor ambient air were collected at 27 properties in Libby where EPA clean-up activities were scheduled. These samples were collected before clean-up began, and the measurements were intended to help determine if the clean-up activities caused a measurable release to outdoor ambient air. These samples were collected and analyzed in accordance with the Draft Final Response Action Work Plan (CDM 2003a). The duration of sampling at these individual properties was limited to one to two days.

The conclusions derived for the sample data evaluated as part of the Summary of Asbestos Levels in Ambient Air in Libby, Montana report (EPA 2006b) were as follows:

- The presence of LA fibers was identified in outdoor ambient air samples collected around the Libby community.

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- Sources of the LA fibers found in outdoor ambient air in Libby are not known with certainty, but it seems likely that windborne transport of fibers present in soils and dust around the community is one important component.

- Concentration levels do not appear to be substantially different at different locations within the main residential-commercial section of Libby, but may be higher closer to the mine.

- Current data are too limited to determine if any time trend towards changed levels in outdoor ambient air is occurring as a result of on-going EPA clean-up activities, but collection of additional current and future outdoor ambient air data will help answer this question.

The conclusions of the 2006 ambient air summary report are limited by the following:

- Data presented in the report are incomplete because of lack of seasonal and geographic representation over time, and there are an insufficient number of data points at adequate sensitivity.

- The preliminary analyses presented assume that "non-detect" values are equal to zero. EPA Region 8 is currently reviewing this approach for analyzing "non-detect" results.

- The methodology for estimating risk ranges is preliminary and should be considered draft.

- Evaluation of risk in the document is limited to a single pathway and does not address cumulative exposure from multiple pathways at the Site.

EPA identified the need for further investigations of outdoor ambient air in Libby and its vicinity, specifically: collection of additional outdoor ambient air data; refinement of the methodology for estimating human health risk ranges for the Libby population; and consideration of cumulative exposures in evaluating risk.

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Section 3
Data Quality Objectives

The DQO process, based on scientific methods, is a series of planning steps that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. EPA has issued guidelines to help data users develop site-specific DQOs (EPA 2006a). These guidelines were followed for the development of the DQOs presented in this section.

The DQO process specifies project decisions, the data quality required to support those decisions, specific data types needed, data collection requirements, and analytical techniques necessary to generate the specified data quality. The process also ensures that the resources required to generate the data are justified. The DQO process consists of seven steps; output from each step influences the choices that will be made later in the process. These steps include:

1. State the problem
2. Identify the decision
3. Identify the inputs to the decision
4. Define the study boundaries
5. Develop a decision rule
6. Specify tolerable limits on decision errors
7. Optimize the design

3.1 Step 1 – State the Problem

The purpose of this step is to describe the problem to be studied so that the focus of the investigation will be unambiguous.

As determined by previous investigations conducted at the Site, LA is present in multiple environmental media in Libby including: indoor air, outdoor ambient air, indoor dust, vermiculite insulation, and soils. As a result, residents of Libby may be exposed to LA, and these exposures may pose a risk of cancer and/or non-cancer effects. One pathway that is of potential concern to EPA is inhalation of LA in outdoor ambient air. However, as noted above (see Section 2.3), the current data set for LA concentrations in outdoor ambient air in Libby is not extensive enough to support risk assessment calculations for this exposure pathway with acceptable levels of confidence because the data may not be fully representative over geographic area and/or time, and because many of the data have a high (poor) analytical sensitivity, which tends to limit confidence in estimates of long-term average exposure levels.

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3.2 Step 2 – Identify the Decision

This step identifies what questions the investigation will attempt to resolve and what actions may result.

The decisions EPA is seeking to make are: 1) whether the levels of LA in outdoor ambient air contribute a risk of cancer or non-cancer effects, either alone or in combination with other exposure pathways, that is within an acceptable range of risks under a reasonable maximum exposure scenario, and 2) whether the data identify any significant differences as a function of time or space in OU4. The risk assessment will support EPA's decisions about whether additional clean-up actions (over and above those already occurring in Libby) are needed to reduce or eliminate sources of LA contamination in Libby that contribute to outdoor ambient air.

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3.3 Step 3 – Identify the Inputs to the Decision

The purpose of this step is to identify the environmental data that need to be obtained and the measurements that need to be taken to resolve the decision statements.

The key environmental data required to estimate cancer and non-cancer risks from exposure to outdoor ambient air are reliable and representative (over space and time) data on the long-term average concentration of LA in outdoor ambient air within an exposure unit at the Site. These data may then be analyzed using appropriate statistical methods to determine if there are important spatial patterns (i.e., significant differences between sub-areas) or important time trends in the data (e.g., significant differences between seasons, a changing time trend as cleanup activities continue, etc.). Based on these analyses, the data may then be grouped into appropriate geographical and temporal data sets, from which long-term average values may be calculated. The long-term average value for a specified area and time frame is the key determinant of the cancer and non-cancer risk to residents and workers exposed in that area and time.

In this regard, it is important to recognize that there are several alternative strategies for specifying the concentration of asbestos in air and in using those data to estimate exposure and risk. At present, final decisions have not been made regarding which approach(es) will be used, so it is important that the data obtained provide full details on the particle size (length, width, mineral type) of all asbestos structures observed, so that these data can be used to compute the appropriate concentration values for use in whatever alternative risk models may be selected for use at the Site.

3.4 Step 4 – Define the Boundaries of the Study

This step specifies the spatial and temporal boundaries of this investigation.

3.4.1 Spatial Bounds

The study will focus on collection of data from OU4 that are representative of the main residential-commercial area of the Libby Valley. This area is indicated in Figure 3-1. This area is selected as the focus of this program because this is where the

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majority of area residents and workers live and work. Levels of LA in outdoor ambient air in other parts of OU4 as well as locations associated with other Operable Units (e.g., the mine, Rainy Creek Road, Stimson Lumber, the former Screening Plant, Export Plant and other former processing facilities, the community of Troy, etc.) will be investigated under separate sampling designs, as necessary.

Based on the data available to date, no clear differences are apparent in average LA concentrations in different sub-locations in the main residential commercial area of Libby (identified as Zones 1, 2 and 3 in the ambient air summary report [EPA 2006b]). Therefore, it may be appropriate to consider the main residential-commercial area of the Libby Valley as one exposure unit and to calculate the long-term average concentration of LA in outdoor ambient air by combining all the data . However, if the new data reveal important spatial variations in long-term average outdoor ambient air levels, then it may be appropriate to subdivide the main area of Libby into two or more sub-areas, each of which would be considered separate exposure units and would be evaluated separately for this pathway.

In addition to samples in the main residential-commercial parts of Libby, samples will also be collected at several stations that are well removed from the Libby Site such that impact from past or present releases of LA are not expected to be of concern. Data from these reference stations will be compared with measurements from stations in OU4 to help estimate the magnitude of Site-related releases to outdoor ambient air.

3.4.2 Temporal Bounds

The program will begin in October 2006. The duration of the monitoring program cannot be stated with certainty, since the magnitude of temporal variability (by day, by season, by year) is not yet known. Further, the magnitude of any effect of on-going clean-up actions on outdoor ambient air levels is not known. However, in order to ensure that temporal variability on the scale of days and months is adequately captured in the data set, it is expected that the program will endure a minimum of 1 year. If it is determined that there is a need to capture additional data to improve the temporal representativeness of the data set and/or to collect data that will allow an assessment of long-term trends that may be resulting from on-going cleanup activities, then it is expected that the program will be extended for several additional years. These decisions will be made by the risk managers once the data collected from the initial year are evaluated, and after consultation with EPA's scientific support team at the Site.

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3.5 Step 5 – Develop Decision Rules

The purpose of this step is to describe the method that EPA will use to make final risk management decisions from the data.

At present, risk management decision rules for the Site have not yet been defined. Because outdoor ambient air is only one of several exposure pathways that will be evaluated as part of the baseline human health risk assessment, it is expected that the decision rule for outdoor ambient air will take the form that the residual cancer and

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non-cancer risk associated with the reasonable maximum exposure scenario contributed by this pathway may not exceed some specified level (either an absolute level or alternatively, some proportion of the total risk).

In the absence of a quantitative decision rule, it is tentatively assumed for the purposes of planning the monitoring program that if risks associated with inhalation of outdoor ambient air under reasonable maximum exposure conditions approach or exceed a cancer risk level of 1E-05 (one in 100,000) or a non-cancer Hazard Quotient (HQ) of 0.1, the outdoor ambient air pathway may be an important contributor to the total cumulative risk and that, in this case, the sampling program should have a high ability to detect and reliably quantify the ambient air levels. This assumption is for planning purposes and should not be interpreted as a risk management decision since final risk management decisions will consider the cumulative risk of exposure to multiple exposure pathways. This assumption is used only to support initial efforts to plan the monitoring program.

3.6 Step 6 – Specify Tolerable Limits on Decision Errors

The tolerable limits on decision errors, used to establish performance goals for the data collection design, are specified in this step.

In making risk management decisions with calculated estimates of exposure and risk, two types of decision errors are possible:

- A Type I (false negative) decision error would occur if a risk manager decides that exposure to outdoor ambient air is not of significant health concern, when in fact it is of concern.

- A Type II (false positive) decision error would occur if a risk manager decides that exposure to outdoor ambient air is above a level of concern, when in fact it is not.

EPA is most concerned about guarding against the occurrence of Type I errors, since an error of this type may leave humans exposed to unacceptable levels of LA in outdoor ambient air. For this reason, it is anticipated that exposure assessment for this pathway will be based on the best estimate and the 95% upper confidence limit (UCL) of the long-term average concentration of LA in the area being evaluated. Use of the UCL to estimate exposure and risk helps account for limitations in the data, and provides a margin of safety in the risk calculations, ensuring that risk estimates are unlikely to be too low.

EPA is also concerned with the probability of making Type II (false positive) decision errors. Although this type of decision error does not result in unacceptable human exposure, it may result in unnecessary expenditure of resources. For the purposes of this effort, the strategy adopted for controlling Type II errors is to ensure that if the risk estimate based on the 95% UCL is above EPA's level of concern for this pathway, then the UCL is not larger than 3-times the best estimate of the mean. If the 95% UCL

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is at or above the range that is of potential concern, and the UCL is greater than 3 times the best estimate of the mean, then more data may be needed.

3.7 Step 7 – Optimize the Design for Obtaining Data

This step identifies a resource-effective data collection design for generating data that are expected to satisfy the DQOs.

3.7.1 Estimating the Number of Samples Required

The method used to compute the UCL of a set of outdoor ambient air samples depends on the statistical properties of the data set. Analysis of data available to date indicates that the variability between outdoor ambient air samples may be approximated by a mixed Poisson lognormal (PLN) distribution. Statistical procedures are available to estimate the parameters of the underlying lognormal distribution (Haas et al. 1999), and these fitted parameters may be used to compute the UCL of the mean using the approach for lognormal data sets described in EPA 1992a. Based on this approach, the ratio of the UCL to the mean of a data set (an indication of the statistical uncertainty in the data) is given by

$$\frac{UCL}{Mean} = \exp[\sigma H / \sqrt{(n-1)}]$$

where:

σ = log standard deviation of the measured values
H = statistic described in EPA (1992a)
n = number of samples

Based on available data for air samples from the study area (Zones 1-3 identified in the ambient air summary report (EPA 2006b)), a rough approximation for σ for outdoor ambient air samples from the main part of Libby is 1.9. Figure 3-2 (center line) illustrates the ratio of the UCL to the mean as a function of n for an assumed σ of 1.9. As seen, the ratio (a measure of uncertainty) approaches a value of about 2 as the number of samples approaches about 80-100, and continues to decline slowly as the number of samples increases. Note that a similar pattern in observed for values of σ that are somewhat smaller (lower line) or somewhat higher (upper line).

Based on this analysis, it is expected that if a total of about 80-100 samples per exposure area were collected, and if the value of σ is in the range of 1.5-2.3 (geometric standard deviation [GSD] = 5-10), the uncertainty in concentration would be limited to less than a factor of 3, and that collection of additional samples would result in only minor decreases in uncertainty.

If resulting data (collected over a year's time) support the assumption that the entire study area represents a single exposure unit, then ample data will be collected—well beyond the required 80-100 data points per exposure unit area. However, for study planning purposes, such an assumption cannot be made *a priori*. If it is assumed that

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it may be necessary to divide the study area into 2-3 sub-areas to account for spatial variability, there will likely be 2-3 stations per sub-area, and this will yield 72-108 samples per year per sub-area, which will still be enough to support the study DQOs on their own. The data will be periodically evaluated to determine whether the sample variability supports application of one or more exposure units within the study area and/or whether continuance of the outdoor ambient air monitoring is warranted.

3.7.2 Estimating the Required Analytical Sensitivity

As noted above, for the purposes of this planning document, it is assumed that the analytical sensitivity must be sufficient to ensure reliable detection and quantification if risks from outdoor ambient air approach or exceed a cancer risk of 1E-05 (1 in 100,000) or a non-cancer HQ of 0.1. The concentrations associated with these risk levels may be estimated as described below.

For cancer, a simplified equation for computing the risk associated with some specified concentration is:

$$\text{Risk} = C \cdot TWF \cdot UR$$

where:

Risk = risk of lung cancer or mesothelioma from the exposure being evaluated
C = long-term average concentration of asbestos (structures per cubic centimeter [s/cc])
TWF = time weighting factor (percent of full time that exposure occurs)
UR = unit risk for lifetime exposure

The target analytical sensitivity is then computed by rearranging the equation as follows:

$$\text{Target Analytical Sensitivity} \leq 1E\text{-}05 / (TWF \cdot UR)$$

For planning purposes, it is conservatively assumed that the TWF is 1.0. This corresponds to exposure to outdoor ambient air that occurs 24 hrs/day for a lifetime (actual exposures are likely to be lower than this for most people). Based on EPA's currently recommended risk model (IRIS 2006), the unit risk factor for lifetime exposure is 0.23. Thus, the level of concern for LA in air would be about:

$$\text{Target Analytical Sensitivity} \leq 1E\text{-}05 / 0.23 = 0.00004 \text{ s/cc}$$

For non-cancer effects, the basic risk equation is:

$$HQ = C \cdot (ET/24 \cdot EF/365 \cdot ED) / RfC$$

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where:

HQ = hazard quotient (dimensionless)
C = long-term average concentration of asbestos in air (f/cc)
ET = exposure time (hrs/day)
EF = exposure frequency (days/yr)
ED = exposure duration (yrs)
RfC = Cumulative Reference concentration (f/cc-yrs)

At present, no RfC has been established for evaluating non-cancer effects from inhalation of LA, so it is not yet possible to compute an analogous level of concern for this endpoint. In the absence of data, it is tentatively assumed that the target analytical sensitivity that is adequate for evaluating cancer risk will also be sufficient for evaluating non-cancer risks. This assumption will be re-visited when an RfC is developed. Thus, the target analytical sensitivity for outdoor ambient air samples will be $\leq$ 0.00004 s/cc.

3.7.3 Refinements to the Design as Data are Collected

In accordance with EPA's DQO process, it is expected that the outdoor ambient air monitoring program described in this document may be modified periodically as data are obtained. For example, if data suggest that the variability in concentrations over time is low, then EPA may decrease the number of samples collected over a specified period of time. Alternatively, if data suggest that the variability in concentrations over geographic areas is higher than expected, then additional sampling stations may be added to better characterize the spatial variability. Similarly, the target analytical sensitivity may be either increased or decreased, depending on the detection frequency and mean values observed in initial samples results, and on the RfC value when it becomes available.

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Section 4
Sampling Program

This section provides brief summaries of SOPs and additional site-specific detail that may not be discussed in the SOPs. The site-specific procedure will be followed during this investigation. For additional information, field personnel will refer to the SOPs included in Appendix A. The site health and safety plan (HASP) should be consulted to determine health and safety protocols for performing site work. The SOPs and site-specific procedures included in Appendix A are listed below (CDM 2005a):

- Sample Custody (SOP 1-2)
- Packaging and Shipping of Environmental Samples (SOP 2-1)
- Guide to Handling of Investigation-Derived Waste (Modified SOP 2-2)
- Field Logbook Content and Control (SOP 4-1)
- Photographic Documentation of Field Activities (Modified SOP 4-2)
- Control of Measurement and Test Equipment (SOP 5-1)
- Collection of Outdoor Ambient Air Samples (CDM-LIBBY-07)

The following sections are a summary of field activities that will be performed in accordance with this SAP by CDM during the outdoor ambient air sampling investigation.

4.1 Pre-Sampling Activities

Prior to beginning field activities, a field planning meeting will be conducted, an inventory of equipment and supplies will be performed to determine procurements needs, and community involvement activities will be conducted. The following sections discuss these pre-sampling activities.

4.1.1 Field Planning Meeting

A field planning meeting will be conducted by the CDM field team leader and attended by the field staff and a member of the CDM quality assurance (QA) staff as well as EPA support scientists who were instrumental in study design development. The EPA Remedial Project Manger (RPM) will be notified of the date and time of the meeting. The agenda will be reviewed and approved by the QA staff and the health and safety officer prior to the meeting. The meeting will briefly discuss and clarify:

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- Objectives and scope of the fieldwork
- Equipment and training needs
- Field operating procedures, schedules of events, and individual assignments
- Required quality control (QC) measures
- Health and safety requirements
- Documents governing fieldwork that must be on site
- Any changes in the field plan documents

A written agenda, reviewed by the CDM QA staff, will be distributed and an attendance list signed. Copies of these documents are maintained in the project files, in the CDM Denver office. Additional meetings will be held when the documents governing fieldwork require it or when the scope of the assignment changes significantly.

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The field team personnel will perform the following activities before and during field activities, as applicable:

- Review and understand this SAP and HASP
- Ensure that all sample analyses are scheduled through the laboratory
- Obtain required sample containers and other supplies
- Obtain and check field sampling equipment
- Obtain and maintain personal protective equipment (PPE)

4.1.2 Inventory and Procurement of Equipment and Supplies

The following equipment will be required for sampling activities, and any required equipment not already contained in the field equipment supply inventory will be procured prior to initiation of sampling activities:

- Field logbooks
- Indelible ink pens
- Digital camera
- Sample media: 0.8 micrometer (µm) pore size and 0.45 µm, 25-millimeter diameter mixed cellulose ester (MCE) filter cassettes.
- Sample paperwork and sample tags/labels
- Custody seals
- Zipper-top baggies
- Air sampling equipment as described in CDM-LIBBY-07
- PPE as required by the HASP

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4.1.3 Community Coordination

Prior to the implementation of the sampling events described in this SAP, the owner of each property where sampling is proposed will be contacted to determine his/her desire to participate in this investigation. The property owner will be advised of the study's duration (at least a year and perhaps longer) and will be informed of the importance of obtaining samples consistently over that extended time period. Access agreements will be obtained as required. A CDM community involvement coordinator will contact each resident to describe the program and the potential impact to the resident (e.g., sample technicians visiting the property at regular intervals, the expected duration of the program). Each residential or commercial property participating in this investigation will be reimbursed for power used from their service to run sampling equipment.

4.2 Field Documentation

Field documentation to be generated during this sampling study includes the following: logbooks, field sample data sheets (FSDSs), daily reports, photographs, and sample custody documentation. The following sections describe the types of documentation as well as how field documents will be corrected if errors occur and the process for documenting deviations from field procedures prescribed in this SAP.

4.2.1 Field Logbooks and Records

Field logbooks will be maintained in accordance with CDM SOP 4-1, Field Logbook Content and Control (Appendix A). This log is an accounting of activities at the Site and will note issues or deviations from the governing plans and observations relating to the sampling and analysis program. Field administrative staff will manage the logbooks and will send original field logbooks, as they are completed, to the CDM project file repository in Denver, Colorado for document control. A copy of each logbook will be maintained in the CDM office in Libby, Montana. In addition, copies of all field logbook entries will be provided to EPA and SRC at the conclusion of each sampling event. Electronic copies are suitable and will be placed in the project e-room within one week from the completion of each sampling event.

Detailed sampling notes will be recorded for each sample on an FSDS (Attachment to CDM-LIBBY-07). The comment section of the FSDS will only be used only to note which samples will initially be archived or if a sample is voided. Specific observations regarding the reasons a sample is voided and all other comments regarding samples will be recorded on the Daily Observation/Impact (DOI) Memorandum so that they may be electronically stored in the Volpe Libby2 database. Field administrative staff will manage the FSDSs and will send copies to the CDM project file repository in Denver, Colorado for document control and to the John A. Volpe National Transportation Systems Center (Volpe Center) for data entry required in the project database. Original FSDSs will be maintained in the CDM office in Libby, Montana. In addition, copies of all FSDS will be provided to EPA and SRC at the conclusion of each sampling event. Electronic copies are suitable and will be placed in the project e-room within one week from the completion of each sampling event.

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For each day that outdoor ambient air samples are collected in association with this SAP, a DOI Memorandum will be completed. An example of this memorandum is included as an attachment to CDM-LIBBY-07. The purpose of this memorandum is to capture, in an easy to access format, any actions or issues that could affect the results or viability of an outdoor ambient air sample. Electronic files will be stored on the Libby office server with the following file name format:
AAS_date, where:

AAS = Ambient Air Sampling
Date = MM/DD/YY

Copies of all DOI Memorandums will be provided to EPA and SRC at the conclusion of each sampling event. Electronic copies are suitable and will be placed in the project e-room within one week from the completion of each sampling event.

To track the scheduling of calibration checks the field teams will use the Calibration Check Schedule Worksheet. An example of this worksheet is included as an attachment to CDM-LIBBY-07. The field team leader will store the original worksheets in the CDM office in Libby, Montana. In addition, copies of all the worksheets will be provided to EPA and SRC at the conclusion of each sampling event. Electronic copies are suitable and will be placed in the project e-room within one week from the completion of each sampling event.

4.2.2 Photographic Documentation

Photographic documentation will be recorded for each sampling location at first collection event and any time thereafter that the equipment is moved, damaged or the surroundings change, and at any other place the field sampling personnel determine necessary, with a digital camera in accordance with CDM SOP 4-2, Photographic Documentation of Field Activities (Appendix A) with the following site-specific modifications.

Section 5.2.2, General Guidelines for Still Photography – A slate is not required for each new roll of film. The information for the slate will be recorded in the field logbook (e.g., direction of the photograph, surrounding landmarks, etc.). All team members, as stated in the logbook, will be photographers and witnesses at the locations. Slates are not required for close-up photographs, and instead the required information can be listed in the digital photograph file name. A color strip is not required for close-up or feature photographs.

File names will be in the format: last name of property owner_address_AAS_date, where:

AAS = Ambient Air Sampling
Date = MM/DD/YY

Section 5.2.4, Photographic Documentation – The name of the laboratory, time and

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date of drop-off, and receipt of film are not required to be recorded for this project.

Section 3.3.2, Archive Procedures – Digital photographs will be archived on the CDM Libby Server (secure) with nightly backup. These files will be archived until project closeout, at which point project management will determine a long-term electronic file storage system.

4.2.3 Sample Labeling and Identification

Samples will be labeled with index identification numbers supplied by field administrative staff, and will be signed out by the sampling teams (i.e., controlled). One sample label will be placed on the sampling cassette. The sample identification number will also be written on the outside of the plastic bag used to hold the sampling cassette during transport.

Sample index identification numbers will identify the samples collected during the outdoor ambient air study by having the following format:

AA-#####

Where: AA = Ambient air
= a sequential five digit number

To ensure that samples are properly handled during the sample coordination phase, the location description field on the FSDS will be used to summarize the sample classification in the following format:

Location Description	Sample Description
AA-HV-03	Ambient air sample collected at ***higher flow*** rate from ***3*** feet above ground
AA-LV-03	Ambient air sample collected at ***lower flow*** rate from ***3*** feet above ground
AA-HV-05	Ambient air sample collected at ***higher flow*** rate from ***5*** feet above ground
AA-LV-05	Ambient air sample collected at ***lower flow*** rate from ***5*** feet above ground
AA-HV-05-TEM	Ambient air sample collected at ***higher flow*** rate from ***5*** feet above ground ***on a TEM cassette***
AA-LV-05-TEM	Ambient air sample collected at ***lower flow*** rate from ***5*** feet above ground ***on a TEM cassette***
AA-CO	Ambient air co-located sample
AA-Blank	Ambient air blank

4.2.4 Field Sample Custody and Documentation

Sample custody and documentation will follow the requirements specified in CDM

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AA-HV-06 = ambient air high flow sample collected from 6 feet above ground¶
AA-LV-03 = ambient air low flow sample collected from 3 feet above ground¶
AA-LV-06 = ambient air low flow sample collected from 6 feet above ground¶
AA-CO = ambient air co-located sample¶
AA-Blank = ambient air field blank sample¶
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SOP 1-2, Sample Custody (Appendix A). All samples and sampling paper work will be relinquished to the sample coordinator at the end of each day. Field administrative staff will be responsible for management of all field forms.

4.2.5 Corrections to and Deviations from Documentation

Logbook modification requirements are described in CDM SOP 4-1, Field Logbook Content and Control (Appendix A). For the logbooks, a single strikeout initial and date is required for documentation changes. The correct information should be entered in close proximity to the erroneous entry. These procedures will also be followed for the correction of any field form. All deviations from the guiding documents will be recorded on the DOI Memorandum (Attachment to CDM-LIBBY-07) and the Libby Asbestos Project Record of Form (Appendix B). Any major deviations will be documented according to the CDM QA plan (CDM 2005c).

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4.3 Outdoor Ambient Air Sampling

The following sections describe the process of selection of outdoor ambient air sampling locations, the procedures for sample collection, and requirements for collection and submission of QA/QC samples.

4.3.1 Selection of Outdoor Ambient Air Sampling Locations

Outdoor ambient air sampling will be conducted at 14 specified locations in the main residential/commercial area of Libby (Figure 4-1). This number of stations was selected so that, if the data indicate that it is necessary to divide the study area into 2-3 sub-areas to account for spatial variability in long-term averages, there will likely be at least 3-5 stations present in each sub-area, which will help ensure that the data set for each sub-area remains spatially representative.

The locations of these 14 stations were selected using a stratified random approach, in which the study area was divided into 14 grids, and 1 location was selected within each grid. The specific location within each grid was chosen on a random basis by selecting locations that have available electricity and could be accessed year-round. This is important to help ensure that the stations will provide adequate spatial coverage of the study area.

Once the sampling stations have been established at each location, the global positioning system (GPS) coordinates of each station will be measured and will be used to help in spatial pattern analysis and in the preparation of maps which summarize findings.

In addition to the 14 outdoor ambient air sampling locations shown in Figure 4-1, two reference samples will be collected; in Eureka and Helena, Montana. Eureka was chosen because it is a location known to have buildings with vermiculite attic insulation. The Eureka sample will be collected at the county maintenance shop located at 101 Iowa Flats Road. The Helena sample will be collected at a private residence located at 1735 Missoula Avenue.

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Meteorological (MET) data station data (wind speed, direction, temperature, humidity, precipitation) will be downloaded daily from the internet from the following weather stations as reported hourly by the National Oceanic and Atmospheric Administration (NOAA):

- Libby Fire Cache (NOAA station identification = LBBM8)
- Eureka (NOAA station identification = EURM8)
- Helena Regional Airport (NOAA station identification = KHLN)

Although not considered necessary for the calculation of risk data, MET data may be used to understand temporal patterns of results and sample representativeness.

4.3.2 Sampling Protocol

Outdoor ambient air samples will be collected and equipment calibrated in accordance with CDM-LIBBY-07 which is based on EPA SOP #2015 (Appendix A) for asbestos air sampling. In brief, outdoor ambient air sampling pumps will be placed on the east or west side of buildings approximately 15 feet away from outer walls to reduce building interference with wind patterns and allow the samples to be exposed to the dominant northwest to southeast air patterns in the valley. Sample locations will be chosen so that particulates generated by automobile traffic on dirt and gravel roads will be minimized.

Equipment shelters, such as those shown in Appendix C, will be used to house the sampling pumps. The use of these shelters will protect the sampling equipment from adverse weather conditions that would otherwise interfere with the collection of year-round samples.

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4.3.2.1 Collection Interval and Flow Rates

Based on a site-specific pilot study conducted in July 2006, it was determined that outdoor ambient air samples collected in the Libby Valley with total volumes of 12,000 liters showed good particle distribution and that samples with total volumes approaching 23,500 liters were approaching overloaded. Documentation of the flow rates and sample durations used in the pilot study are included in Appendix D.

In order to help ensure that target analytical sensitivities can be achieved, the target volume of air to be collected for each sample will be 14,000 liters. To help ensure that samples capture temporal variability, each sample will be collected over a 5 day (120 hour) interval. Thus, the target flow rate is approximately 2 liters per minute. At each station, a second sample will be collected with a lower flow rate (1.5 liters per minute) over the same period of time. This sample is intended to serve as a backup for use if the sample collected at the higher flow rate is overloaded. Thus, the low flow sample will initially be archived, and will not be analyzed unless the primary sample is determined to be overloaded by laboratory analyst.

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As samples are initially collected during this program and analyzed, these flow rates and sample times may be adjusted to ensure the sample filter has proper loading for the required analytical analysis and sensitivity goals.

4.3.2.2 Sampling Schedule

At each station, sampling will occur on a regular 10 day schedule. This will result in the collection of 36 samples per year per station. Table 4-1 shows an example of the staggered schedule for the first month of the investigation. The schedule presented in Table 4-1 is only intended to provide an example for execution, and specific start dates for each sample location may be adjusted.

Sample collection will begin over a 3 to 4 hour period on a predetermined day of the week. During the first two sample collection events, every sample will be checked on 3 to 4 hour schedule, after that each sample cassette will be checked at a reduced frequency phased down from every 6 to 8 hours to twice a day for visible loading and to ensure the pump flow rate is within method requirements. If visible loading is observed on a filter, or if decreased flow is noted due to filter plugging, the collection of that sample will be concluded, duration of collection will be noted, and the sample submitted for analysis. Samples will not be submitted on more than one cassette if visible loading is observed, instead the analysis of the sample will be modified (more grid openings counted) to ensure the appropriate analytical sensitivity is reached.

The sample at the Helena location will be collected on Sunday through Friday every other week. Due to the remote location of the Eureka sampling location (70 miles north-northeast of Libby), samples from this station will be collected over a 32- hour period. To account for the shorter sampling periods for the Helena and Eureka samples, somewhat higher flow rates will be used so that the sample volumes collected will be similar to the volumes that will be collected in Libby. The flow rates for the Eureka samples will be 2.4 and 3.2 liters/minute, and the Helena samples will be collected at 1.8 and 2.5 liters/minute, respectively for the low and high volume samples.

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sample volumes collected will be similar to the volumes that will be collected in Libby.

Sampling may be suspended if adverse weather conditions exist (e.g., precipitation that could interfere with sample viability and/or equipment function, hazardous winter road conditions). If this occurs, the EPA RPM will be notified immediately. It is suspected that due to the use of the equipment shelters (Appendix C) sampling will only be affected by extreme weather or winter road conditions.

4.3.2.3 Filter Type – Pore Size

Samples will be collected using 25-millimeter diameter, 0.8 µm pore size MCE filter cassettes. The choice of 0.8 µm pore size is based on the fact that most air samples collected in Libby to date have used this pore size. This pore size has been used at Libby because it allows for the collection of samples with relatively high flow rates (and hence relatively large volumes) without excessive backpressure.

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In order to investigate whether the choice of pore size is an important determinant of observed concentrations, samples using 0.45 µm pore size filters will also be collected during the first two sampling events at the following six stations which were selected

to represent 2 sampling stations from the north end of the study area, the middle of the study area, and the south end of the study area:

- 1915 Kootenai River Road
- 247 Indian Head Road
- 60 Port Blvd
- 378 Cabinet View Road – pump house
- 475 Fish Hatchery Road
- 119 Evans Rd

In order to assess any differences over time in concentrations observed on the two filter pore sizes, additional samples will be collected. Samples will be collected on both filter pore sizes, as described in this section ,at two different properties, for the first two sampling rounds during each of the following months: February 2007, June 2007, and October 2007 in order to account for seasonal changes. The table below summarizes the property addresses where these samples will be collected.

Sampling Event	Sampling Locations
February 2007	101 Ski Road
	899 Farm to Market Road
June 2007	3088 Hwy 37 N
	501 Mineral Ave
October 2007	2264 Hwy 2 S
	1427 Hwy 37 N

This will result in collection of 24 sets of paired samples (same place, same time, different pore size) that will be compared using appropriate statistical tests determine if there is any statistically significant difference in samples results as a function of pore size.

These samples will be collected at two flow rates from 5 feet above ground surface as described in Section 4.3.2.1.

4.3.2.4 Sample Height

All samples will be collected from the height of an adult's breathing zone, approximately 5 feet above ground level by using lengths of Tygon® tubing that reach from the sampling pump positioned in the equipment shelter to a sampling stand designed to hold the sampling media at desired heights.

In order to investigate whether levels may tend to be different at a child's breathing height (3 feet) than at an adult's breathing height (5 feet), samples will be collected at both 3 feet and 5 feet above ground level during the first two sampling rounds at the following 6 sampling locations:

- 1915 Kootenai River Road

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- 247 Indian Head Road
- 60 Port Blvd
- 378 Cabinet View Road – pump house
- 475 Fish Hatchery Road
- 119 Evans Rd

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These locations were selected to represent 2 sampling stations from the north end of the study area, the middle of the study area, and the south end of the study area.

In order to assess any difference over time in concentrations observed for the two sample collection heights, additisonal samples will be collected. Samples will be collected at both heights as described in this section at two different properties for the first two sampling rounds during each of the following months: February 2007, June 2007, and October 2007 in order to account for seasonal changes. The table below summarizes the property addresses where these samples will be collected.

Sampling Event	Sampling Locations
February 2007	101 Ski Road
	899 Farm to Market Road
June 2007	3088 Hwy 37 N
	501 Mineral Ave
October 2007	2264 Hwy 2 S
	1427 Hwy 37 N

This will result in the collection of 24 pairs of filters (same location, same time, different heights) that will be compared using appropriate statistical methods to determine if there are any meaningful differences between the heights, and this information will be used to determine whether continued sampling at both 3 feet and 6 feet is required.

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These samples will be collected at two flow rates on 0.8 µm filters as described in Section 4.3.2.1.

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4.3.2.5 Duration of the Sampling Schedule

As noted above, the full duration of the monitoring program can not be specified with certainty at this time, but it is expected that the program will last for at least 1 year, and may extend beyond that point. Assuming that 36 samples per year are collected from each of 14 stations in the Libby study area, this will result in the collection of a minimum of 504 additional outdoor ambient air samples. As noted above, this number is expected to provide a good characterization of both geo-spatial and temporal variability, even if it is necessary to divide the study area into 2-3 sub-locations.

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4.3.3 Chain-of-Custody Requirements

Chain-of custody (COC) procedures will follow the requirements as stated in CDM SOP 1-2, Sample Custody with modification (Appendix A). The COC record is used as physical evidence of sample custody and control. This record system provides the means to identify, track, and monitor each individual sample from the point of collection through final data reporting. A complete COC record is required to accompany each shipment of samples.

At the end of each day, all samples will be relinquished to the sample coordinator by the sampling team following COC procedures. The sample coordinator will follow COC procedures to ensure proper sample custody between acceptance of the sample from the field teams to shipment to the laboratory.

Copies of all COCs for ambient air samples will be provided to EPA and SRC at the conclusion of each sampling event. Electronic copies are suitable and will be placed in the project e-Room within one week from the completion of each sampling event.

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4.3.4 Sample Packaging and Shipping

Samples will be packaged and shipped in accordance with CDM SOP 2-1, Packaging and Shipping of Environmental Samples, with modification (Appendix A). A custody seal will be placed so that both ends of the sampling cassette are covered by the seal. If an overnight delivery service is used to ship the samples, the samples will be secured for shipment in a rigid container with sufficient packing material to prevent dislodging the collected fibers. Vermiculite, shredded paper, or expanded polystyrene cannot be used as packing material. Plastic bubble wrap is an example of an acceptable packing material.

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4.4 Equipment Decontamination

Sampling will be completed with dedicated field equipment, and equipment decontamination will not be required for the activities described in this SAP.

4.5 Handling Investigation Derived Waste

Any disposable equipment or other investigation derived wastes will be handled in accordance with CDM SOP 2-2 with Site-specific modifications, Guide to Handling of Investigation-Derived Waste (Appendix A).

4.6 QA/QC Activities

This section describes the QA/QC activities that will be conducted to ensure samples collected during this effort are of sufficient quality to meet the project DQOs.

4.6.1 Calibration and Control of Sampling Equipment

Prior to the collection of each sample, the sampling pump for that sample will be calibrated to the required flow rate by use of an adequately maintained secondary calibration standard according to CDM SOP 5-1, Control of Measurement and Test

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Equipment (Appendix A) and EPA SOP 2015 (Appendix A).

4.6.2 Collection of QA/QC Field Samples

Four types of QA/QC samples will be collected as part of this investigation: lot blanks, field blanks, drying blanks, and co-located samples. COCs submitted will indicate which sample is the field blank and which blank is to be used for the drying blank.

Lot blanks – Before samples are collected, two cassette lot blanks from each filter lot, for both 0.8 µm and 0.45 µm cassettes will be randomly selected and submitted for analysis. The lot blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. The entire batch of cassettes will be rejected if any asbestos fiber is detected on the lot blanks.

Field blanks – One field blank will be collected each day sample collection begins. One field blank, chosen at random, will be analyzed per week for this sampling study. Field blanks will be collected for both filter types when they are in use. If asbestos fibers are observed on a field blank, other field blanks collected during that week will be submitted for analysis to determine the potential impact on sample results. The field blanks will be analyzed for asbestos fibers by the same method as will be used for field sample analysis. The blanks will be collected at different locations throughout the week (one collected at a different location on each day of the week). Field blanks are collected by opening the sample cassette to the ambient environment for 10 seconds then re-capping the sample cassette.

Drying blanks – Drying blanks will be used to ensure asbestos structures are not being lost during the filter drying procedures implemented by the on-site laboratory. Based on observations from the initial sampling events, moisture promoting biological growth was observed inside the sample cassettes, interfering with direct sample preparation methods. As a result, the on-site laboratory will dry the sample cassettes prior to preparation for analysis. The field team will submit an unopened PCM cassette on each COC for the laboratory to use as a drying blank. The cassette will be given a unique identification number and a FSDS will be completed for the blank. This drying blank will be used to determine if the drying process is a potential source of contamination in the field samples.

Co-located samples – Co-located samples are used to determine the variability of the measured parameter. Because co-located outdoor ambient air samples are expected to be very nearly identical in true concentration, a comparison of the results between the two samples will be interpreted primarily as a reflection of the variability in the analytical method, which includes random Poisson variation in the number of structures observed. The two results will be compared using an appropriate statistical test for the comparison of two Poisson rates, and the samples will be considered concordant if the rates are not statistically different.

Co-located samples will be collected at a frequency of one per sampling event per filter type and height being sampled during an event (at least 26 per year) at both the

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higher and lower flow rates. Field co-located samples will be collected beside a field sample and given a unique index identification number. Field co-located samples should be collected from varying locations throughout the study area and on both filter types when they are in use. The sampler will assign the same location ID to the co-located sample as the field sample, and will record the identification number of the field sample on the FSDS in the comments section. Co-located samples will be sent for analysis by the same method as field samples.

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Results from co-located samples will be evaluated according to criteria established in Libby Laboratory Modification Form LB-000029a (CDM 2003b) for re-preparation samples, as follows:

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Overall Concordance Rate	Evaluation
>95%	Good
90-95%	Acceptable
< 90%	Poor

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If, after the collection of a minimum of 10 co-located samples, the overall concordance rate for co-located samples drops below 90%, EPA will investigate the basis for the discrepancy and take corrective action in sampling and/or analysis of the samples, as appropriate.

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Section 5
Laboratory Analysis and Requirements

The laboratories used for all sample analysis will have participated in, and acceptably analyzed, the required parameters in the last two proficiency examinations from the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program. The laboratory must also analyze project specific performance evaluation samples when requested. These analyses must be performed before any samples are submitted to the laboratory to confirm the laboratory's capabilities and may be subsequently submitted at regular intervals. In addition, the laboratory must participate in the laboratory training program developed by the Libby laboratory team.

5.1 Analytical Methods

The outdoor ambient air and QA/QC samples will be submitted to a subcontracted laboratory for analysis using the ISO transmission electron microscopy (TEM) method 10312, also known as ISO 10312:1995(E) (CDM 2005b) with project specific modifications LB-000016, LB-000019, LB-000028, LB-000029, LB-000029a, LB-000030 (CDM 2003b). All asbestos structures (including not only Libby amphibole but all other asbestos types as well) having length greater than or equal to 0.5 um and an aspect ratio ≥ 3:1 will be recorded on the Libby site-specific laboratory data sheets and electronic deliverables. To enable the sample to be properly prepared and to prevent subsequent biological growth, all samples will be dried upon receipt at the onsite laboratory (EMSL-Libby), prior to further preparation/analysis at the onsite laboratory or transmittal to another laboratory for further preparation/analysis as specified in LB-000055.

In the event that samples need to be checked for loading prior to analysis, the laboratory who will be performing the analysis shall be responsible for sample preparation. This procedure will prevent the receiving laboratory from performing estimations on cut filters should indirect sample preparation methods be needed.

As stated in LB-000029, LB-000029a, and LB-000055, the frequency for laboratory-based QC samples for TEM analysis is:

QC Sample Type	Frequency
Lab blank	4%
Recount Same	1%
Recount Different	2.5%
Re-preparation	1%
Verified Analysis	1%
Inter-laboratory	0.5%
Drying Blank	One per COC

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Due to concerns related to the efficiency of sampling pumps over the required sampling time, 0.8 µm filters will be used instead of the traditional 0.45 µm called for when collecting samples for TEM analysis. In addition, the use of 0.8 µm filters will help reduce loading concerns typically encountered when collecting samples of long duration and high volume. Historical ambient air samples at the site were also collected on 0.8 µm filters; by using these filters for this sampling program, data comparability will be improved. This decision may be re-evaluated if evidence is obtained to indicate that there is a statistically significant difference between results for 0.8 µm versus 0.45 µm filters (see Section 4.3.2.3, above). To ensure the use 0.8 µm filters is evaluated, during the first two sampling events 0.45 µm filters will also be co-collected as described in Section 4. Both sample filters will be submitted for analysis.

All field samples collected at the higher flow rate and the appropriate number of QA/QC samples will be submitted for analysis each week to the on-site laboratory. If samples collected at the higher flow rate are overloaded the lower volume sample will be submitted for analysis.

Sample Archival

All samples will be delivered to the on-site laboratory for drying followed by analysis or archival per directions given on the COC. After all analysis on a batch set of samples in complete, the samples will be stored (archived) following the laboratory's standard sample storage procedures that have been audited and accepted by EPA.

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All samples planned for immediate analysis will be distributed to the on-site project laboratory. Once analyzed, all samples will be stored (archived) at the on-site laboratory under COC until further notice.

5.2 Analytical Sensitivity

The target analytical sensitivity for outdoor ambient air for this investigation is 0.00004 s/cc. In the event of sample loading or any other issues when a sensitivity of 0.00004 s/cc can not be achieved, the laboratory may report a sample result with a higher (poorer) sensitivity *only after consultation with EPA project personnel*.

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5.3 Holding Times

No preservation requirements or holding times are established for air samples collected for asbestos analysis. In the event samples can not be delivered to the on-site laboratory for drying within 24 hours after sample collection, the samples shall be refrigerated to prevent biological growth inside the filter cassettes.

5.4 Laboratory Custody Procedures and Documentation

Laboratory custody procedures are provided in the laboratory's QA management plan, which are approved by CDM as part of the laboratory procurement process. Upon receipt at the laboratory, each sample shipment will be inspected to assess the condition of the shipping container and the individual samples. This inspection will include verifying sample integrity. The enclosed COC records will be cross-referenced with all of the samples in the shipment. The laboratory custodian will sign these records and provide copies for placement in the project files. The sample custodian may continue the COC record process by assigning a unique laboratory

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number to each sample on receipt. This number, if assigned, will identify the sample through all further handling at the laboratory. It is the laboratory's responsibility to maintain internal logbooks and records throughout sample preparation, analysis, and data reporting.

5.5 Documentation and Records

Data reports will be submitted to the CDM laboratory coordinator and include a case narrative that briefly describes the number of samples, the analyses, and any analytical difficulties or QA/QC issues associated with the submitted samples. The data report will also include signed COC forms, analytical data summary report pages, and a summary of QC sample results and raw data, where applicable. Raw data are to consist of instrument preparation and calibration logs, instrument printouts of field sample results, QC sample results, calibration and maintenance records, COC check in and tracking, raw data count sheets, spectra, micrographic photos, and diffraction patterns. All original data reports will be filed in the CDM project repository in Denver, Colorado. The laboratory also will provide an electronic copy of the data to the laboratory coordinator and others as directed by CDM.

5.6 Data Management

Sample results data will be delivered to the Volpe Center and CDM's Denver office both in hard copy and as an electronic data deliverable (EDD). Electronic copies of all project deliverables, including graphics, will be filed by project number. Electronic files will be routinely backed up and archived.

All results, field data sheet information, and survey forms will be maintained in the Libby project database managed by the Volpe Center. In addition, Volpe Center personal will post copies of all EDDs in the project e-room and CDM will post copies of the hard copy reports upon their receipt.

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Section 6
Assessment and Oversight

Assessments and oversight reports to management are necessary to ensure that procedures are followed as required and that deviations from procedures are documented. These reports also serve to keep management current on field activities. Assessment, oversight reports, and response actions are discussed below.

6.1 Assessments

Performance assessments are quantitative checks on the quality of a measurement system and are appropriate to analytical work. Performance assessments for the laboratories may be accomplished by submitting reference material as blind reference (or performance evaluation) samples. These assessment samples are samples with known concentrations that are submitted to the laboratories without informing the laboratories that they are performance samples. Laboratory audits may be conducted upon request from the EPA RPM or Volpe Center PM.

Performance samples will be submitted to each laboratory analyzing samples associated with this investigation. The submission frequency may be as frequent as at least once every three months.

System assessments are qualitative reviews of different aspects of project work to check on the use of appropriate QC measures and the functioning of the QA system. Project assessments will be performed under the direction of the QA managers, who report directly to the CDM president. Quality Procedure 6.2, as defined in the CDM QA Manual (CDM 2005d), defines CDM 's corporate assessments, procedures, and requirements. Due to the amount of sampling and the duration of the Libby project, both a field audit and an office audit are scheduled for the Site annually.

6. 2 Response Actions

Response actions will be implemented on a case-by-case basis to correct quality problems. Minor response actions taken in the field to immediately correct a quality problem will be documented in the applicable field logbook and a verbal report will be provided to the CDM PM. For verbal reports, the CDM PM will complete a communication log to document the response actions were relayed to him/her. Major response actions taken in the field will be approved by the CDM PM, the EPA RPM, and Volpe PM prior to implementation of the change. Major response actions are those that may affect the quality or objective of the investigation. Quality problems that cannot be corrected quickly through routine procedures may require implementation of a corrective action request (CAR) form.

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All formal response actions will be submitted to either CDM 's QA manager and/or project QA coordinator for review and issuance. CDM 's PM or local QA coordinator will notify the QA manager when quality problems arise that may require a formal response action. CAR forms will be completed according to Quality Procedure 8.1 of the CDM QA Manual (CDM 2005d).

In addition, when modifications to this specific SAP are required, either for field or laboratory activities, a Libby Asbestos Project Record of Modification Form (Appendix C) must be completed.

6.3 Reports to Management

QA reports will be provided to management whenever quality problems are encountered. Field staff will note any quality problems on field data sheets, or in field logbooks. CDM 's PM will inform the project QA coordinator upon encountering quality issues that cannot be immediately corrected. Weekly reports and change request forms are not required for this work assignment. Monthly QA reports will be submitted to CDM 's QA manager by the project QA coordinator.

Topics to be summarized regularly may include but not be limited to:

- Document technical and QA reviews that have been conducted
- Activities and general program status
- Project meetings
- Corrective action activities
- Any unresolved problem
- Any significant QA/QC problems not included above

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Section 7
Data Validation and Usability

Laboratory results will be reviewed for compliance with project objectives. Data validation and evaluation are discussed in Sections 7.1 and 7.2, respectively.

7.1 Data Review, Validation, and Verification Requirements

No formal data validation for these media is currently required of CDM. At the request of Volpe Center, CDM will validate data submitted by analytical laboratories. Data validation consists of examining the sample data package(s) against pre-determined standardized requirements. The validator may examine, as appropriate, the reported results, QC summaries, case narratives, COC information, raw data, initial and continuing instrument calibration, and other reported information to determine the accuracy and completeness of the data package. During this process, the validator will verify that the analytical methodologies were followed and QC requirements were met. The validator may recalculate selected analytical results to verify the accuracy of the reported information. Analytical results will then be qualified as necessary.

Data verification includes checking that results have been transferred correctly from laboratory data printouts to the laboratory report and to the EDD. Data verification for this project is primarily performed as a function of built-in quality control checks in the Libby project database when data is uploaded. However, the sample coordinator will notify the laboratories and the project database manager (Mr. Mark Raney, Volpe Center) of any discrepancies found during data usage.

7.2 Reconciliation with Data Quality Objectives

Once data has been generated, CDM evaluates data to determine if DQOs were achieved. This achievement will be discussed in the measurement report, including the data and any deviations to this SAP. Sample data will be maintained in the project database. Laboratory QC sample data will be stored in hard copy (in the project files) and in a separate database.

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Section 8
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